What is claimed is:

1. A magnetic tunnel junction device comprising:

a substrate; and

a fixed layer, a tunnel barrier, and a free layer sequentially stacked on the substrate,

wherein a magnetoresistance buffer layer formed of a metallic nitride is interposed between the fixed layer and the tunnel barrier, and the entire magnetic tunnel junction device is thermally treated so as to reduce the magnetic junction resistance thereof.

2. The device as claimed in claim 1, wherein nitrogen is combined with elements of the tunnel barrier during the thermal treatment to form a nitrogen rich layer at the tunnel barrier.

3. The device as claimed in claim 1, wherein the fixed layer includes a seed layer, a pinning layer, and a pinned layer, which are sequentially deposited.

4. The device as claimed in claim 3, wherein the seed layer is a ferromagnetic layer formed of one selected from the group consisting of NiFe, Ru, and Ir.

5. The device as claimed in claim 3, wherein the pinning layer is a semi-ferromagnetic layer formed of one selected from the group consisting of FeMn and IrMn.

6. The device as claimed in claim 3, wherein the pinned layer is a ferromagnetic layer formed of one selected from the group consisting of NiFe and CoFe.

7. The device as claimed in claim 1, wherein the magnetoresistance buffer layer is a metallic nitride layer formed of FeN.

8. The device as claimed in claim 1, wherein the tunnel barrier is an insulating layer formed of AlO_X.

9. The device as claimed in claim 1, wherein the thermal treatment comprises heating the magnetic tunnel junction device at a temperature of 150 to 300°C and slowly cooling the magnetic tunnel junction device.

10. A method for fabricating a magnetic tunnel junction device comprising:

(a) depositing a fixed layer on a substrate and processing the surface of the fixed layer using nitrogen plasma;

(b) sequentially stacking a tunnel barrier, a free layer, and a capping layer on the fixed layer and thermally treating the tunnel barrier, the free layer, and the capping layer to thereby fabricate the magnetic tunnel junction device with a reduced magnetoresistance.

11. The method as claimed in claim 10, wherein the fixed layer, the tunnel barrier, the free layer, and the capping layer are deposited by sputtering.

12. The method as claimed in claim 10, wherein in (a), the nitrogen plasma processing comprises applying a direct power to a nitrogen atmosphere under a predetermined pressure to generate nitrogen plasma and bringing the nitrogen plasma into contact with the fixed layer.

13. The method as claimed in claim 10, wherein in (b), the thermal treatment comprises heating and then slowly cooling the tunnel barrier, the free layer, and the capping layer one or more times, wherein each heating is performed at a temperature between 150 °C and 300 °C.

14. The method as claimed in claim 10, wherein in (b), a magnetic field is applied to the magnetic tunnel junction device during the thermal treatment.

15. The method as claimed in claim 10, wherein the thermal treatment leads nitrogen to combine with elements of the tunnel barrier.

16. The method as claimed in claim 10, wherein the fixed layer comprises a seed layer, a pinning layer, and a pinned layer, which are sequentially stacked on the substrate.

17. The method as claimed in claim 16, wherein the seed layer is a ferromagnetic layer formed of one selected from the group consisting of NiFe, Ru, and Ir.

18. The method as claimed in claim 16, wherein the pinning layer is a semi-ferromagnetic layer formed of one selected from the group consisting of FeMn and IrMn.

19. The method as claimed in claim 16, wherein the pinned layer is a ferromagnetic layer formed of one selected from the group consisting of NiFe and CoFe.

20. The method as claimed in claim 10, wherein the magnetoresistance buffer layer is a metallic nitride layer formed of FeN.

21. The method as claimed in claim 10, wherein the tunnel barrier is an insulating layer formed of AlO_X.